Status of the First Four AES 9-cell Cavities

Data from JLab, KEK, LANL, FNAL

C.M. Ginsburg (Fermilab)

Fermilab SRF R&D Meeting

December 8, 2008

AES cavity processing @JLab

Processing Recipe
J. Mammosser (JLab), TTC Mtg@Fermilab, April 2007

- Processing recipe
  - –Degrease
  - –Electropolishing (20 μm)
  - –Degrease
  - –First HPR+dry
  - –First cleanroom assembly
  - –Second HPR+dry
  - –Final cleanroom assembly
  - –Evacuation and leak check
  - –Low temperature (110 C) bake

Note: all cavities get 150 um bulk EP

Material Removal (microns)
R. Geng (JLab), AES Mtg @JLab, Aug 2007

	1st test	2nd test	3rd test	4th test
AES1	213	236	252	269
AES2	164	190		
AES3	177	200		
AES4	221	257	277	

Note: updates to AES2,3,4 since August 2007 are not shown

Most of the AES1-4 cavity processing work was done >1 year ago

AES1 Summary

- JLab: 4 process/tests Mar.-May 2007
  - Quench field repeatedly ~17 MV/m; no x-rays measured
  - Pass-band mode measurements implicate cell #3 and #7 ; confirmed with FNAL fast thermometry to be cell 3 (counting from input coupler)
- Visited PAC07 for LANL show-and-tell
- FNAL: 3 tests Sep.-Dec.2007
  - Only HPR (at JLab) before first test
  - Quench field repeatedly ~16 MV/m; no x-rays measured
  - passband mode measurements and FNAL fast thermometry found hot spot(s) in heat-affected zone
- KEK/Kyoto: Assorted development/commissioning Dec.2007-Dec.2008
  - First demonstration of Kyoto/KEK camera system: double-spot found corresponding to quench location; additional spot found
  - mode measurements imply max gradient anywhere ~lower 20's MV/m; some field emission seen at higher gradients
  - used for STF commissioning, including light EP
  - gradient improved to 22 MV/m; mode measurements imply 6 cells limited to ~lower 20's MV/m, 3 cells could get up to 40 MV/m
- Currently: en route from KEK back to FNAL

AES2 Summary

- All work was done at JLab
- Always quench limited
  - 19.6,18.0, 26.0, 32.8 MV/m
- The best of the bunch
- Currently at JLab

AES3 Summary

- JLab: 4 process/tests Jun.-Aug. 2007
  - Quench field repeatedly ~18 MV/m; no x-rays measured
  - Pass-band mode measurements implicate cell #4 and #6 ; confirmed with FNAL fast thermometry to be cell 4 (counting from input coupler)
  - mode measurements imply max gradient anywhere ~lower 20's MV/m; some field emission seen at higher gradients
- FNAL: 2 tests Jan.-Apr. 2008
  - hot(-test) spot found more precisely, mode measurements, first test of variable coupler
- LANL:
  - test stand commissioning and instrumentation development
  - bunch of spots found correlated with thermometry
  - Has been scratched on the iris (see picture next slide)
- Currently: in use at LANL for test stand commissioning and instrumentation development through Jan.2009

AES3 scratch

T. Tajima (LANL), TTC 2008, Oct 2008

Office of Science

Cell 7 iris to cell 6, approx. 70°. This might have been caused by a screw head of the inspection system.

Los Alamos NATIONAL LABORATORY EST. 1943

UNCLASSIFIED

Slide 18

Operated by Los Alamos National Security, LLC for NNSA

NNSA

AES4 Summary

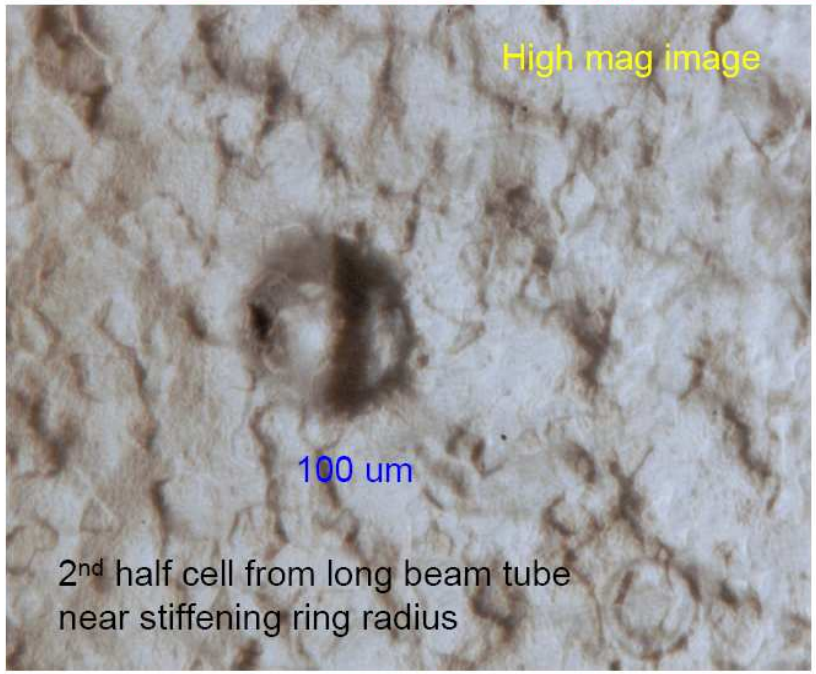
- All work was done at JLab
- Always field-emission limited
  - 28.0, 25.5,19.5, 21.5, 27.0 MV/m
  - Iris defect found with optical inspection (see next slide)
- Currently at FNAL/ANL

AES4 defect

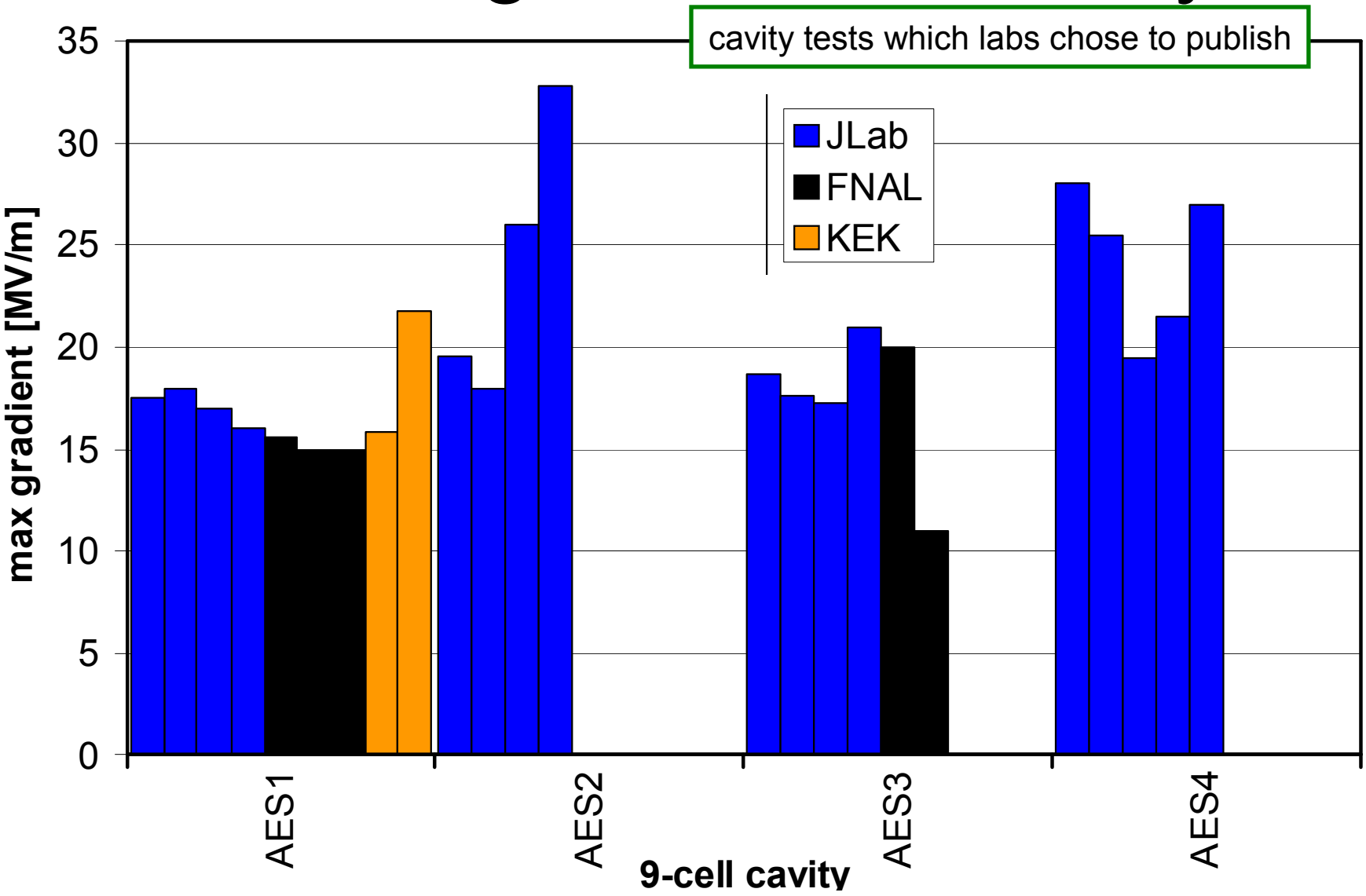
R. Rimmer (JLab), LCWS 2008, Nov 2008

AES4 High E Field Region

Cavity FE limited even after repeated EP
pass-band measurements suggest field emitters in end cells



AES1-4 gradient summary



Americas Cavity Summary